

Physiological Lesion Assessment**Moscone West, 2nd Floor, Room 2000****Tuesday, October 29, 2013, 1:00 PM–3:15 PM**

Abstract nos: 76-84

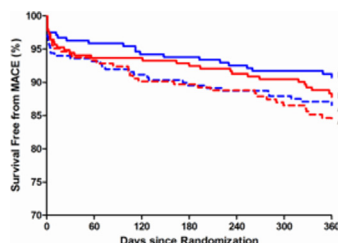
TCT-76**Does Age Affect Fractional Flow Reserve-Guided Percutaneous Coronary Intervention? A FAME (Fractional Flow Reserve Versus Angiography for Multivessel Evaluation) Trial Substudy**Hong-Seok Lim¹, Bernard De Bruyne², William F. Fearon³, Bong-Ki Lee⁴, Nico Pijls⁵, Pim A. Tonino⁶, Andy S. Yong⁷¹Stanford University Medical Center, Stanford, California, ²N/A, Aalst, Belgium, ³Stanford, Stanford, CA, ⁴Stanford University Medical Center, Menlo Park, CA, ⁵N/A, Eindhoven, The Netherlands, ⁶Catharina hospital, Eindhoven, Netherlands, ⁷Stanford University Medical Center, Stanford, CA

Background: Fractional flow reserve (FFR)-guided percutaneous coronary intervention (PCI) improves outcomes compared with an angiography-guided strategy in patients with multivessel coronary artery disease. Changes which occur in the coronary microvasculature as we age may affect the results of FFR-guided PCI in multivessel disease.

Methods: We analyzed the results of FFR-guided PCI in the 512 patients enrolled in the FAME study who were less than the mean age of 65 years old compared to the 493 patients ≥ 65 years old.

Results: The 1-year rate of death, myocardial infarction or repeat revascularization in the angiography-guided group tended to be higher than in the FFR-guided group for both those patients < 65 (17.2% vs. 12.0%, $p=0.098$) and those ≥ 65 years old (19.7% vs. 14.3%, $p=0.111$) without any significant interaction based on age ($p=0.920$). In patients ≥ 65 years old, the FFR was significantly higher in vessels with 50% to 70% visual stenosis (0.83 ± 0.11 vs. 0.80 ± 0.13 , $p=0.028$) and with 71% to 90% visual stenosis (0.69 ± 0.15 vs. 0.64 ± 0.16 , $p=0.002$). Elderly patients had a significantly lower proportion of functionally significant lesions (FFR ≤ 0.80) in vessels with 71% to 90% stenosis (78.8 vs. 87.4%, $p=0.011$) compared to younger patients.

Conclusions: FFR-guided PCI is beneficial regardless of age, however, older patients have fewer functionally significant lesions, despite a similar angiographic appearance.

**TCT-77****Safety of provocative tests to detect coronary artery spasm. Results from a French registry including 2,430 patients.**Helene Aelion¹, Aures Chaib², Emmanuel Salengro³, Stephane Manzo-Silberman⁴, Marie Caroline Chenilleau⁵, Julien Rosencher⁶, christophe Meune⁷, Alain Cariou⁶, Simon Weber⁵, Olivier Varenne⁶¹Hopital Cochin, Paris, ile de france, ²Montreuil Hospital, Montreuil, France, ³Hôpital Villeneuve Saint Georges, Villeneuve Saint Georges, France, ⁴Hopital Lariboisière, Paris, France, ⁵Hôpital Cochin, Paris, France, ⁶Cochin Hospital, Paris, France, ⁷Hôpital Avicenne, Bobigny, France

Background: The use of provocative tests (PT) to diagnose coronary artery spasm (CAS) varies largely within countries, hospitals, and physicians. PT-related complications are one of the main reasons for not performing PT to detect CAS in patients with compatible symptoms.

Methods: We report the incidence of complications during and immediately after PT in 2,430 patients with normal or near normal coronary arteries over the last 10 years. Methylethylgometrine maleate 0.4mg was injected intravenously immediately after conventional diagnostic angiography and then followed by another injection in the left and right coronary arteries 3 minutes later.

Results: Average patient age was 55 years (48-64) and there were more men (52.3%). Reasons for coronary angiography were non-specific chest pain at rest (62.2%), acute coronary syndrome (16.9%), angina at rest and stress (10.2%), silent ischemia (8.9%)

and out-of-hospital cardiac arrest (1.8%). Overall, complications including myocardial infarction (n=1), ventricular fibrillation (n=1), asystole (n=3), atrio-ventricular block (n=2), persistent CAS (n=3), delayed CAS (n=4), transient ischemic stroke (n=4), migraine (n=2), peripheral spasm (n=1), systemic embolism (n=1), bronchospasm (n=1) were reported in 0.9% of patients. The complication rate was 0.3% in patients with a normal PT. Most of the reported complications were related to the angiography procedure rather than to PT. Patients with PT-related complications were more often hospitalized for acute coronary syndrome and more likely to have mild atheroma in coronary arteries than those with no complications (47.8% vs. 16.6%; $p<0.001$ and 60.9% vs. 28.1%; $p<0.01$; respectively).

Conclusions: Complications are extremely rare in selected patients with suspected CAS. The potential severe outcomes for patients with undiagnosed and untreated CAS, together with the high safety of PT, would justify a shift in paradigm towards a more systematic detection of CAS during conventional coronary angiography for patients with chest pain at rest.

TCT-78**Abstract Withdrawn****TCT-79****Reclassification of Coronary Revascularization Strategy With Fractional Flow Reserve (FFR) at time of diagnostic angiography: Insights from a Large French Multicenter FFR Registry (R3F)**Eric Van Belle¹, Gilles Rioufol², Christophe Pouillart³, Thomas Cuisset⁴, Emmanuel Teiger⁵, Didier Barreau⁶, Michel Hanssen⁷, Loic Belle⁸, Cyril Besnard⁹, Christophe Bretelle¹⁰, Patrick Dupouy¹¹¹Hôpital cardiologique CHRU Lille, Lille, France, ²Hôpital Louis Pradel - Cardiologie Interventionnelle, Lyon, France, ³Unité de Cardiologie Diagnostique & Interventionnelle, La Réunion, La Réunion Ste Clotilde, La Réunion, ⁴CHU Timone, Inserm, U626, Faculté de Médecine, Marseille, France, ⁵Henri Mondor University Hospital, Creteil, France, ⁶C.H.I.T.S. Hôpital Sainte Musse, Lille, Nord Pas de Calais, ⁷centre hospitalier haguenau, haguenau, Haguenau, Haguenau, ⁸CH Annecy, USCn Cardiologie, Angiologie, Annecy, Annecy, ⁹HCL Groupement Hospier Nord - Hôpital de la Croix-Rousse, Lyon, Lyon, ¹⁰CH Valence, Cardiologie, Valence, Valence, ¹¹Hôpital privé d'Antony, Antony, Antony

Background: Fractional flow reserve (FFR) is useful in patients preselected for coronary revascularization. There is no large report of its impact on the decision of coronary revascularization on individual patients referred for diagnostic angiography. **Methods:** The R3F registry investigated 1,075 consecutive patients undergoing diagnostic angiography including an FFR investigation at 20 french centers (Oct. 2008-June 2010). Investigators were asked to define prospectively their revascularization strategy "a priori" based on angiography alone before performing the FFR. The final revascularization strategy, "reclassification" of the strategy by FFR, and 1-year clinical follow-up were prospectively recorded.

Results: 75% of patients were males with a mean age of 65 ± 11 years. They had nonsignificant ($< 50\%$ stenosis) angiographic coronary artery disease (14%), significant ($> 50\%$) angiographic 1 vessel (39%), 2 vessel (28%) or 3 vessel disease (19%). The overall MACE (death, MI, revascularization) rate at 1 year was 11.6%. The "strategy a priori" based on angiography alone was medical therapy in 55% and revascularization in 45% (PCI=38% and CABG=7%). The final strategy applied according to FFR measurements was medical therapy in 58% and revascularization in 42% (PCI=32% and CABG=10%). However in individual patients, the final strategy based on the results of the FFR was different from the "strategy a priori" in 43% of the cases: This was observed in 33% of "a priori" medical patients, in 56% of "a priori" PCI patients and in 62% of "a priori" CABG patients. Interestingly, in "reclassified" patients who were treated based on the FFR and not on the angiography based "a priori" decision (n=464), the 1-year outcome was as good as in patients in whom the final decision concurred with the decision "a priori" (n=611, MACE= 11.2% vs. 11.9%, $p=0.78$).

Conclusions: This study demonstrates that the use of FFR during diagnostic angiography is associated with reclassification of the revascularization decision in about half of the patients. It further demonstrates that it is safe to pursue a revascularization strategy divergent to that suggested by angiography alone but guided by FFR measurements.

TCT-80**Applicability of hybrid strategy (resting index plus selective FFR) to assess hemodynamic significance of coronary stenoses depends on FFR distribution**Nils P. Johnson¹, Ke Xu², Akiko Maehara³, Philippe Genereux², Richard L. Kirkendeel¹, K. L. Gould¹, Gregg Stone³, Allen Jeremias⁴¹University of Texas Medical School, Houston, TX, ²Cardiovascular Research Foundation, New York, NY, ³Cardiovascular Research Foundation and Columbia University Medical Center, New York, NY, ⁴Cardiovascular Research Foundation and Stony Brook University, Woodbury, NY

Background: With FFR as the reference standard, a resting index (iFR or rest Pd/Pa) may offer high diagnostic accuracy for lesion subsets with high or low FFR. Selective FFR measurement for intermediate values of a resting index has been termed

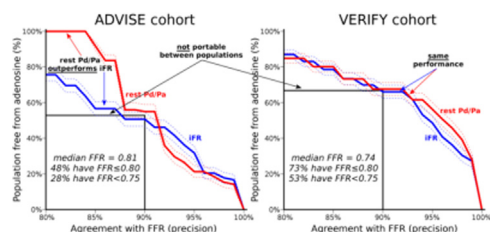
a "hybrid" strategy. In an international, multicenter, core lab study (RESOLVE) adenosine could have been avoided in ~50% of lesions while maintaining a diagnostic accuracy $\geq 90\%$. However, the size of the resulting "adenosine free" zone might differ among populations.

Methods: Two subsets of lesions from the RESOLVE study were contrasted given their different FFR distributions: ADVISE (original study, registry, and Seoul study) and VERIFY (prospective and retrospective arms).

Results: VERIFY had a significantly lower FFR distribution compared to ADVISE (Table). Fewer lesions required adenosine in VERIFY compared to ADVISE, a consistent trend over the entire spectrum of FFR agreement (Figure). No significant difference existed between iFR and Pd/Pa for avoiding adenosine, although Pd/Pa outperformed iFR in the ADVISE cohort at lower FFR agreements.

Table. Physiologic contrast between ADVISE and VERIFY cohorts

	ADVISE cohort	VERIFY cohort	p value
Number of lesions	611	654	N/A
FFR	0.81 [0.73, 0.88]	0.74 [0.65, 0.81]	<0.001
Rest Pd/Pa	0.93 [0.89, 0.97]	0.90 [0.86, 0.95]	<0.001
iFR	0.91 [0.86, 0.95]	0.87 [0.79, 0.93]	<0.001
% with FFR ≤ 0.80	48%	73%	<0.001
% with FFR ≤ 0.75	28%	53%	<0.001
Pd/Pa and iFR correlation (R^2)	0.95	0.96	N/A



Conclusions: Different population FFR distributions affect the size of the adenosine free zone. A population whose FFR distribution centers near 0.80 offers fewer applicable lesions for avoiding adenosine as part of a hybrid strategy.

TCT-81

Doppler-flow and pressure derived hyperemic microvascular resistance measurements predict abnormal $H_2^{15}O$ PET-quantified myocardial blood flow after primary PCI

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Background: Primary percutaneous coronary intervention (PCI) leads to optimal angiographic restoration of flow in more than 90% of ST elevated myocardial infarction (STEMI) patients. However, in a large proportion of these patients, myocardial perfusion does not recover adequately despite good angiographic results. This study aimed to investigate the predictive value of intracoronary Doppler-flow and pressure measurements for restoration of myocardial perfusion in the days following a myocardial infarction. Myocardial perfusion was quantified by $H_2^{15}O$ positron emission tomography (PET) imaging.

Methods: 51 STEMI patients were included and treated with primary PCI. Directly following successful revascularization, intracoronary Doppler-flow and pressure measurements (ComboWire XT, Volcano Corporation, San Diego, California) were obtained in the culprit artery and in an unobstructed reference coronary artery. Pressure-flow derived hyperemic microvascular resistance (HMR) was defined as the ratio between distal pressure and flow velocity. $H_2^{15}O$ PET imaging was performed 4-6 days after primary PCI. To discriminate between normal and abnormal myocardial blood flow on PET imaging, the coronary flow reserve (CFR) was used. CFR was defined as the ratio between peak myocardial blood flow (MBF) after induction of hyperemia by adenosine administration and MBF under basal conditions with a cutoff value of 2.0. Subsequently, HMR was compared to PET derived MBF.

Results: The mean HMR in the culprit artery was 3.00 ± 1.41 and 2.96 ± 1.72 in the reference artery. In the culprit artery, HMR was significantly higher when an abnormal PET derived MBF was found (3.66 ± 1.42 vs. 2.52 ± 0.94 ; $p=0.019$). In the reference

artery HMR was similar in patients with a normal and an abnormal MBF (3.13 ± 1.53 vs. 2.73 ± 1.94 ; $p=0.531$).

Conclusions: Doppler-flow and pressure derived HMR is a good predictor to discriminate between normal and abnormal PET derived myocardial blood flow in the culprit artery after primary PCI.

TCT-82

Fractional Flow Reserve versus Angiography in Guiding Management to Optimize Outcomes in Non-ST Elevation Myocardial Infarction (FAMOUS – NSTEMI) Clinical Trial: Relationships Between FFR and Angiographic Stenosis Severity at Baseline.

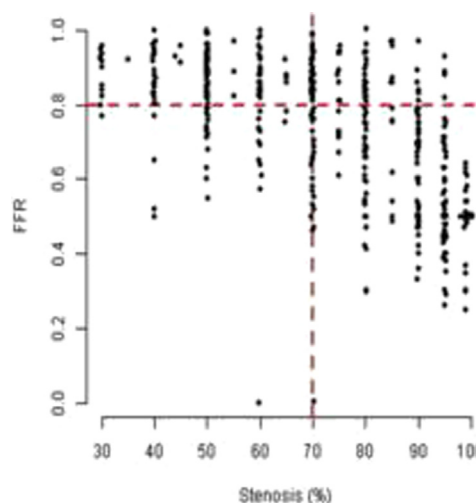
Jamie Layland¹, Nick Curzen², Arvind Sood³, Rajiv Das⁴, Kanarath Balachandran⁵, Shahid Junejo⁶, Matthew M. Lee⁷, Nadeem Ahmed⁷, Ahmed M. Mahrour⁸, Mark C. Petrie⁹, Hany Eteiba⁷, Stuart Watkins⁷, Martin M. Lindsay⁹, Margaret B. McEntegart¹⁰, Andrew Davie⁷, Robert A. Henderson¹¹, Ian Ford¹², Keith G. Oldroyd¹², Colin Berry¹³

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Background: Treatment decisions in the invasive management of patients with non-ST elevation myocardial infarction (NSTEMI) are usually made based on visual interpretation of the coronary angiogram. The relationships between coronary stenosis severity and myocardial fractional flow reserve (FFR) in this setting are uncertain. We hypothesized that functional assessment of coronary stenosis severity with fractional flow reserve (FFR) would differ markedly with angiography.

Methods: FAMOUS-NSTEMI (NCT01764334) is a prospective multicenter randomized double-blind controlled trial in patients with ≥ 1 coronary stenosis $\geq 30\%$ severity (threshold for FFR measurement). Stenosis severity was assessed visually by the cardiologist in the catheter laboratory. FFR was measured in coronary arteries with a stenosis $\geq 30\%$ severity including culprit and non-culprit lesions.

Results: 350 patients were randomized between October 2011-May 2013 in 6 UK hospitals. The participant characteristics were: mean \pm SD age 60 ± 15 years, 74% men, 45% history of hypertension, 14% treated diabetes, 8% prior PCI and 10% prior MI. The median (IQR) time from the index event to the initial angiogram was 3.0 (2.0, 6.0) days. The median (range) GRACE Score was 180 (8, 269). On average each patient had 1.9 ± 0.8 angiographically diseased coronary arteries (left main 10%, RCA 58%, LAD/Diagonal 54%, Cx/OM 64%). There was marked discordance between stenosis severity and FFR (Figure 1).



Conclusions: Compared to FFR, visual assessment over-estimated angiographic lesion severity in a high proportion of cases. This relationship was at least as discordant as in FAME.